Adaptation of sheep breeding systems to changes in the Algerian steppe context: Case of the region of M'Sila

I. Hadbaoui[1], A. Senoussi[1] and J. Huguenin[2]

[1]Laboratory of Bioressources Saharan: Safeguarding and Valorisation.
University Kasdi Merbah-Ouargla, Ouargla 30000, Algeria
[2]UMR SELMET, TA C-112. CIRAD Montpellier, France

Abstract. The Algerian steppe extends over an area of 20 million hectares (rainfall between 100 and 400 mm/year). It supports a grazed ecosystem whose balance had been found by local populations, in particular through movements of animals (Achaba and Azzaba). But for about half a century, the steppe knew many socio-economic and environmental changes, of which the most notable: (i) the depletion of naturals pastures, as a result of the degradation of the steppe rangelands, (ii) an accelerated demographic growth, which is reflected in an increase in household needs and the necessity to find a satisfactory income for the family, and (iii) economic instability, especially the arrival of imported livestock feed. And despite the upheaval which the steppe knew, the breeders still keep the activity of sheep breeding and herd numbers are constantly increasing. Hence the need for making studies to understandthe dynamics of the breeding systems, very important element in the implementation of development programs. In this study, we are interested in the analysis of the different mechanisms of flexibility and adaptation of sheep breeding in M'Sila region, One of the main wilayas (departments) of the Algerian steppe. We conducted interviews with thirty sheep breeders representing the different breeding systems in the area. After analyzing the results of the undertaken interviews, we noted a wide range of practices of innovations adopted by the breeders facing to the various changes in the socio-economic and environmental contexts, both nationally and locally. Diversification of sources of income, readjustment of tribal rangelands distribution rules, adaptation of animal feeding to the fodder deficit, are all indications that the present study attempts to clarify.

Keywords. Changes – Adaptation – Sheep breeding – Algerian steppe – M'Sila.

Adaptation des systèmes d'élevage ovin aux changements du contexte steppique algérien : Cas de la région de M'Sila

Résumé. *La steppe algérienne s'étend sur une superficie de 20 millions d'hectares (pluviométrie entre 100 et 400 mm/an). Sur la steppe se greffe un écosystème pâturé dont l´équilibre avait été trouvée par les populations locales, notamment grâce à des mouvements pendulaires des animaux (Achaba et Azzaba). Mais depuis environ un demi-siècle, la steppe a connu de nombreux changements socio-économiques et environnementaux, dont les plus remarquables : (i) l'appauvrissement des pâturages naturels suite à la dégradation des parcours steppique, (ii) une croissance démographique accélérée, qui se répercute par une augmentation des besoins des ménages, et la nécessité de trouver un revenu satisfaisant à la famille, (iii) l'instabilité économique surtout pour l´apparition des aliments de bétails importés. Et malgré tout le bouleversement qu'a connu la steppe, les éleveurs maintien toujours l'activité de l'élevage ovin et les effectifs ne cessent de s'augmenter. D'où la nécessité de faire des études pour comprendre les dynamiques des élevages, élément très important dans la mise en œuvre de différents programs de développement. Alors, dans cette étude, on s'est intéressé à l'analyse des différents mécanismes de flexibilité et d'adaptation des élevages ovins dans la région de M'Sila, l'une des principales wilayas (départements) de la steppe algérienne. Pour ce faire, nous avons mené des entretiens auprès de trente éleveurs d'ovins représentant les différents systèmes d'élevage existants dans la région. Après analyse des résultats des suites des enquêtes entreprises, on relève la présence d'une large gamme de pratiques innovantes adoptées par les éleveurs faisant face aux différentes changements socio-économiques et environnementaux, aussi bien à l'échelle nationale que locale. La diversification des sources de revenu, le réajustement des règles tribales de répartition des terres de parcours, l'adaptation de la conduite alimentaire au regard du déficit des fourragers sont autant d'indices que la présente étude tente d'élucider.*

Mots-clés. *Changements – Adaptation – Élevage ovin – Steppe algérienne – M'Sila.*

I – Introduction

In Algeria, the steppe constitutes a vast area which extends between the Tellian Atlas in North and the Saharian Atlas in the South. It covers a total surface of 20 million hectares (8.4% of the Algerian national territory). It is located between the isohyets of 100 and 400 mm and on altitudes from 600 to 1400 m (Aidoud *et al*., 2006). The bioclimatic characteristics of the steppe make it suited for breeding small ruminants, in particular sheep (species best adapted to the steppe context); this space offers 15 million hectares of rangelands (HCDS, 2008), sheltering 17 million ovine heads (MADR, 2014), 62% of the national ovine livestock.

In the steppe, a balanced grazed ecosystem had been found by the local populations, in particular thanks to pendulum movements of animals (Achaba and Azzaba). But for barely a half-century, the steppe has known many socio-economic and political changes. The accelerated population growth, the tendency towards the sedentarisation and the change of type of living of the local population, the increase in the ovine livestock, the increase in the planted surfaces, as well as the climate changes, all these factors combined contributed to the disturbance of the balance of the steppe ecosystem. The emergence of systems of breeding in transition is the result of the changes which underwent the steppe territory.

From there it is timely, and even important to know the dynamics of the existing sheep breeding systems in order to understand the mechanisms of flexibility and adaptation adopted by the stockbreeders to face this new socio-economic and ecological environment.

II – Material and methods

To answer the objectives assigned by this work, we chose the area of M'Sila. This choice is based on animal and pastoral potentialities which the area conceals (1.63 million sheep per 1 million hectares of rangelands) (DSA, 2016). Field interviews to thirty sheep breeders representing various breeding systems were realized.

III – Results and discussion

1. Sheep breeding systems practiced in M'Sila area

The field investigations revealed that according to the rangelands management style, t two great groups of stockbreeders exist: sedentary stockbreeders (16 stockbreeders of the sample) and the semi-sedentary transhumant stockbreeders (14 stockbreeders of the sample), which determines two extensive breeding systems. The sedentary stockbreeders are characterized by the use of the proximity food resources and a concentration around watering points whatever the year is rainy or not.The semi-sedentary transhumant stockbreeders use the proximity food resources when the year is supposed good in the area (rainy), and access to the resources out of the area when the year is bad (drought). This group is generally the stockbreeders who have materials and financial means to carry out long shifting, to benefit sometimes from the Saharan rangelands (practical of azzaba), and sometimes stubbles and fallow of the Tellian highlands (practical of achaba).

Generally, the current sheep breeding steppic systems are characterized by a sedentarisation of the families of the stockbreeders, which leads obviously to a transformation of the herds feeding system, with a passage of the pastoral mode to agro-pastoral (86.66% of the investigated stockbreeders are agro-stockbreeders). As well as a generalization of the food complementation on rangelands, i.e. passage of grass feeding to concentrate feeding as a reply to the continued rarefaction of natural fodder resources.

2. Main changes in steppic area

The agricultural operating system generally is a total of elements in dynamic interaction (Rosnay, 1975). The steppic region knew many changes on several aspects; each modification is at the same time a consequence and a cause in another phenomenon. Some of these changes are at the origin of the appearance of a new behavior adopted like reaction, but which becomes a current practice thereafter.

All in all, in a rather dynamic ecosystem like the steppic ecosystem, it would be very difficult to isolate a unique element responsible for the changes of area, because the whole system is in dynamic interaction and elements are connected each other. Despite of this constraint, we can quote the principal and most outstanding changes in the area:

The degradation of the natural rangelands. It is the most remarkable phenomenon in the whole steppe, and the area of M'Sila remains among the most affected areas. In little time (hardly one half-century) the rangelands have degraded and disappeared to leave space for poor areas or even bare soils. Actually, the rangelands degradation phenomenon is rather complex in its interactions. The sheep are at the same time destructors of the rangelands (overexploitation) and victims of the impoverishment of these natural fodder resources. In the area of M'Sila, 73.45% of the rangelands are supposed degraded (HCDS, 2010). This state of the rangelands directly affects the sheep breeding, very dependent on the spontaneous steppic vegetation. To face this situation, reactions were adopted by the stockbreeders to cover the feeding needs for the animals.

Climatic hazards and drought. The Algerian steppe had been struck by very outstanding and very long periods of dearth which affected negatively the space of the pastures. Indeed, their impact on the natural vegetation (one of the causes of degradation), as well as on the sheep food, is immediate. Nedjraoui and Bedrani (2008) noted a reduction in rainfall of about 18 to 27%, and an increase of the dry season by two months on the steppe region. In parallel, the climatic data of the area of M'Sila show that the dry season is spread out almost over all the year (except two months December and January).

Evolution of the land law and development policy. Since the independence (1962), the public authorities initiated and implemented several development programs in the steppic areas. These policies were marked by discontinuity or even the inadequacy regarding the steppe context. In spite of this failure, some programs gave results on the field, and some even could upset the image of the pastoral steppe (in particular programs of agricultural development). As a whole, these development policies cause an abrupt change in the socio-economic organization of the steppe namely:

(i) Change in the tribal rules of management of steppic space. In other words, passage of a collective exploitation of the rangelands to a race of individual overexploitation (from the collective era to the individual interest);

(ii) Introduction of new agricultural speculations (cereal crops, crops fodder, vegetable crops, arboriculture… etc). However, these last are not always adapted to the conditions of the steppe region.

3. Adaptation mechanisms of the stockbreeders

In front of each constraint, the stockbreeders always seek either to anticipate or to react to keep the exploitation of their herds. Analysis of the results of the investigations shows the diversity of the adopted mechanisms according to the socio-economic status of the stockbreeder. We can classify the various forms of adaptation according to the mobility of the herds (breeding in sedentary mode or semi-sedentary transhumant mode). Nevertheless, we find practices adopted by the stockbreeders of the two modes.

A. Sedentary stockbreeders

This category of stockbreeders is characterized by the exploitation of the different local food resources (maximum 15 km of distance covered/day). This sedentary mode of management is a form of adaptation of stockbreeders. The sedentarisation finds its explanation in the size of the herds of stockbreeders of this category; 81% of the surveyed sedentary stockbreeders (13 stockbreeders) have a herd whose size does not exceed by the 200 heads, a relatively weak number knowing that in this area some stockbreeders have herds exceeding 2000 heads.

Therefore, it is more effective and more profitable for these stockbreeders to keep their herds and to try to adapt its food control according to the availability of fodder in the area. In this objective, the sedentary stockbreeders adopt a series of mechanisms which are summarized mainly in:

The association of the breeding to agriculture. This mechanism has several dimensions; the association of the sheep breeding to the various agricultural crops (cereal, fodder, arboriculture). This practice has a double objective: it ensure food resources for the animals (grass barley, barley in grain, oats, sorghum, stubble, straw, hay, crops residues), and it is seen as a financial margin of security while diversifying the incomes of the stockbreeder. These economic activities are often better independent with the climatic constraints of the steppe area. Developed agriculture is often led by the irrigation. In addition, this practice is used as much by the sedentary stockbreeders as by the semi-sedentary transhumant stockbreeders. In our sample of study, 83.33% of the stockbreeders have farmlands, and 40% have an average surface between 3 and 10 hectares. Moreover, there exists a positive correlation (r = 0.603) between the surface of the farmland and the size of the herd in possession. Barley is the dominant crop (41.40% of the exploited lands). It has a very important place in the economic life in steppic region and it is used for different purposes (grass fodder, concentrated food, straw and stubble).

The sale of animals for purchase of food. This form of economic management is very widespread in the steppic area. In this logic, the animals constitute “a capital on feet”. The hoarding of the sheep livestock is related to the availability of natural fodder, because in the event of impoverishment of the rangelands, the stockbreeders will be in the obligation to buy food complements (often of the barley in grain) to correct the food deficit. However, there is a whole organizational logic in the priority of animal’s category to sell in first. Lambs fattened initially, then weaned lambs (starting from 6 months age), then ewes of reform. The principle is to preserve the maximum the breeding stocks.

The use of the family labor. It is a very widespread practice to decrease the charges, implying various actors; shepherd, guard, farmer, associated farmer or tractor driver. These activities are often tasks entrusted to family members

The multi-activity. Among the mechanisms of security of the income of households is to have another activity except breeding and agriculture. The 23.33% of the surveyed stockbreeders (either 7 stockbreeders) declare practice another economic activity (often civil servant). This employment ensures a stable income and considered much more as in social security of the household members.

B. The semi-sedentarily transhumant stockbreeders

Like the preceding category, the semi-sedentary transhumant stockbreeders adopt this mode of breeding to benefit the maximum from a free or low costs (stubble) resources. For these stockbreeders, the associated costs with transhumance remain always beneficial in fodder (pre-Saharans rangelands, stubble and fallow of the Tellien areas). The stockbreeders of this category have the financial and material means, as well as an enough heads (from 100 to 1960 heads) to justify the practice of transhumance.

To use the local food resources available in good year and to seek other resources except steppic area when the year is bad: a mechanism practiced since the antiquity and which remains still profitable for these stockbreeders.

In addition, among the mechanisms adopted by these stockbreeders, we can quote the most determining points:

Flexibility of displacements. The principle in the movements of herds is "to seek grass where it is found". It is thanks to the ancestral knowledge network with the indigenous stockbreeders and thanks to mobile telephony facilitating the communications a fast transfer of information as for the status of the vegetation and the climatic conditions prevailing in a given region. Displacements become more targeted and more reasoned but especially faster. We can say that we witness a new mode of transhumance which is closely related to the climatic conditions (good or bad year). This new transhumance is characterized by a spatial and temporal flexibility of displacements. In other words, displacements are not done each year, at the same period, towards the same place. The essential is to find food for the animals starting with the local fodder resources, then most distant.

Adaptation of livestock management to new forms of displacement. This is a global reorganization of the zootechnic calendar to be functional with this mode of transhumance (food, reproduction, sale and purchase of the animals and food, and the practice of fattening). It is the boss (generally the father owner) which makes the decisions concerning the management.

Exceptional displacements. In addition to already quoted transhumances, the stockbreeders proceed to realize other exceptional displacements according to the status year to gain a rangeland judged be interesting to exploit.

IV – Conclusions

From this study, we note a large range of adaptation mechanisms adopted by the stockbreeders of the area of M'Sila. These mechanisms are the result of local innovations emanating from the stockbreeders themselves. Indeed, each breeder seeks to solve the problems of his own herd. These mechanisms have certainly advantages, but some showed their limits. On the other hand, in a situation of vulnerability of the current breeding systems to the various climatic and economic hazards, the question of the future of the sheep breeding in steppe area arises urgently with acuity.

From another point of view, the different forms of adopted adaptations constitute real experimental attempts on field and remain very useful for the elaboration of possible management and development programs adapted to local steppic conditions.

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